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SYNOPSIS OF NORTH-AMERICAN INVERTEBRATES.

XII. THE TREMATODES.

PART I.—THE HETEROCOTYLEA OR MONOGENETIC FORMS.

H. S. PRATT.

THE order Trematoda was established in the year 1808 by Rudolphi, who included in it the following genera: *Monostoma* Zeder, *Amphistoma* Rudolphi, *Distoma* Retzius, and *Polystoma* Zeder. During the succeeding half century, when the greatest activity was shown in the description of new species of trematodes, numerous attempts were made by Von Nordmann, Dujardin, Diesing, Leuckart, and others to arrange them in a system of classification which would express their natural relationships. But lack of accurate information on their anatomy and development led, at one time and another, to numerous errors, such as the inclusion among trematodes of pentastomes, planarians, and leeches, and the description of larval forms for adult animals. Thus, it was not until the year 1858 that a system was constructed which was a satisfactory solution of the problem, and the one which is the foundation of the system in general use to-day. In that year P. J. van Beneden proposed the names "Monogenea" for those trematodes which develop without metamorphosis, and "Digenea" for those which develop with metamorphosis, the former being, for the most part, ectoparasites, and the latter, endoparasites. The great additions, however, which have been made in recent years to our knowledge of trematodes have rendered it increasingly difficult to use these distinctions satisfactorily, and consequently, in 1892, Monticelli proposed an entirely new system, in which trematodes are divided into three groups or suborders, the Heterocotylea, Aspidocotylea, and Malacocotylea, the first

of which exactly coincides with the Monogenea of van Beneden, while the second and third are included in the Digenea. This arrangement has been generally adopted by recent authors, and this synopsis is based upon it.

The following are the families, subfamilies, and genera of the suborder Heterocotylea in Monticelli's system of classification, with certain modifications, however, which have been proposed since 1892 by himself, Braun, Cerfontaine, Goto, Saint-Remy, and others :

Order. — Trematoda Rud.

Suborder I. Heterocotylea Mont.

Family I. Temnocephalidæ Hasw.

Subfamily I. Temnocephalinæ Mont.

Genera : Temnocephala, Craspedella, Dactylocephala.

Subfamily II. Actinodactynellinæ Mont.

Genus : Actinodactylella.

Family II. Tristomidæ Taschbg.

Subfamily I. Tristominæ Mont.

Genera : Tristoma, Nitzschia, Epibdella, Phyllonella, Trochopus, Acanthocotyle, Placunella.

Subfamily II. Encotyllabinæ Mont.

Genus : Encotyllabe.

Subfamily III. Udonellinæ Mont.

Genera : Udonella, Echinella, Pteronella.

Family III. Monocotylidæ Taschbg.

Genera : Monocotyle, Calicotyle, Lophocotyle, Dionchus, Merizocotyle, Microbothrium, Pseudocotyle.

Family IV. Polystomidæ Taschbg.

Subfamily I. Polystominæ v. Ben.

Genera : Polystoma, Erpocotyle, Onchocotyle, Diplobothrium, Sphyrnura.

Subfamily II. Octocotylinæ v. Ben. et Hesse.

Genera : Octocotyle, Octobothrium, Dactylocotyle, Diclidophora, Anthocotyle, Vallisia, Diplozoön, Phyllocotyle, Hexacotyle, Plectanocotyle, Platycotyle, Pleurocotyle.

Subfamily III. Microcotylinæ Taschbg.

Genera : Microcotyle, Gastrocotyle, Axine, Pseudaxine.

Family V. Gyrodactylidæ v. Ben. et Hesse.

Genera : Gyrodactylus, Dactylogyrus, Tetraonchus, Diplectanum, Calceostoma, Amphibdella, Dactylodiscus, Fridericianella, Anoplodiscus.

ORDER. — TREMATODA RUD.

Small parasitic flatworms, with unsegmented, flattened or cylindrical, unciliated bodies, with usually anterior mouth-opening and bifurcate intestine, and without anal opening, which attach themselves to their hosts by means of suckers, or hooks, or both.

KEY TO THE SUBORDERS.

- A*₁. Usually ectoparasitic trematodes living upon the external surface or the gills, or in the mouth or cloaca of aquatic animals (except genus *Polystoma*), to which they attach themselves by means of suckers, or hooks, or both; suckers, when present, are usually near either one or both ends of the body; when at the anterior end, in most cases, a single pair is present; when at the posterior end, in most cases, one or more pairs are present, or, in their place, a sucking disk *Heterocotylea* Mont.
- A*₂. Endoparasitic trematodes which attach themselves to their hosts either by means of one or more median (unpaired) suckers or a large ventral sucking disk; hooks never present.
 - B*₁. Either a large ventral sucking disk or a mid-ventral row of suckers present; no oral sucker; intestine not bifurcate (except possibly *Aspidocotyle*) *Aspidocotylea* Mont.
 - B*₂. Either one or two or, in a few cases, more than two median suckers present; an oral sucker invariably present (except *Gasterostomum*); intestine, except in rare cases, bifurcate
Malacocotylea Mont.

KEY TO THE FAMILIES, SUBFAMILIES, AND GENERA OF THE
HETEROCOTYLEA.

- a*₁. Body with four to twelve finger-like tentacles at anterior end or on lateral sides, and with a posterior sucker; lives on the outer surface of tropical fresh-water crustaceans and turtles, and in the branchial cavity of a mollusk (*Ampullaria*) Family I. *Temnocephalidæ*
- b*₃. Tentacles all preoral Subfamily I. *Temnocephalinæ*
 - c*₁. Tentacles four to six in number; sucker subterminal; two pairs testes.
 - d*₁. Dorsal surface without lamellæ; pharynx distinct
Temnocephala Blanch. (Fig. 1)
 - d*₂. Dorsal surface with several transverse lamellæ; pharynx rudimentary *Craspedella* Hasw. (Fig. 2)
 - c*₂. Tentacles twelve in number; sucker very small; one pair lobed testes; pharynx distinct *Dactylocephala* Mont.
- b*₂. Tentacles not all preoral Subfamily II. *Actinodactynellinæ*
 Tentacles twelve in number at sides and anterior end of pear-shaped

body ; 2 pairs testes ; sucker-like pit near mouth ; mouth with proboscis ; pharynx distinct . . . *Actinodactylella* Hasw. (Fig. 3)

*a*₂. Body without four to twelve finger-like tentacles.

*b*₁. Body usually broad and flattened, sometimes elongate or cylindrical, with a single ventral or terminal posterior sucking disk, usually of large size and armed with hooks and with or without radial ridges ; paired anterior suckers either present or not.

*c*₁. Paired anterior suckers present or in their place a pair of projections (or a pair of glandular depressions, Goto)

Family II. *Tristomidæ*

*d*₁. Body elliptical or circular and flattened.

*e*₁. Sucking disk large, with or without radial ridges, and either sessile or with short stalk ; genital pores in most cases on left . . . Subfamily I. *Tristominæ*

*f*₁. Genital pores on left.

*g*₁. Sucking disk without radial ridges ; four eyes.

*h*₁. Anterior suckers present.

*i*₁. Body elongate ; sucking disk terminal, with (or without, Linton) numerous minute hooks ; testes numerous : in branchial cavity of marine fishes

Nitzschia v. Baer (Fig. 4)

*i*₂. Body elliptical ; sucking disk ventral, with three (two, Linton) pairs of hooks of unequal size and often with papillæ ; two testes : on the skin of marine fishes

Epibdella Blain. (Fig. 5)

*h*₂. Anterior suckers not present, in their place a paired membrane ; sucking disk with two pairs of hooks ; two testes : on the skin of marine fishes

Phyllonella v. Baer (Fig. 6)

*g*₂. Sucking disk with radial ridges ; eyes present or not ; anterior suckers present.

*h*₁. Sucking disk with nine radial ridges and two large hooks ; two testes ; four eyes ; body elliptical : on gills of marine fishes

Trochopus Dies. (Fig. 7)

*h*₂. Sucking disk with four to six faintly marked radial ridges and two or three pairs of hooks ; two testes ; four eyes ; body elongate : on skin of marine fishes

Placunella v. Ben. et Hesse (Fig. 8)

*h*₃. Sucking disk with seven radial ridges ;

body very broad, often circular ; no eyes ;
 numerous testes : on gills or skin of
 marine fishes *Tristoma* Cuv. (Fig. 9)

- f_2 . Genital pores median or on right. Sucking disk
 with numerous radial rows of small hooks ; ante-
 rior suckers present (or in their place a pair of
 glandular depressions, Goto) ; numerous testes :
 on the skin of the skate

Acanthocotyle Mont. (Fig. 10)

- e_2 . Sucking disk joined to body by a long stalk ; genital
 pores median . . . Subfamily II. *Encotyllabinae*
 Body elliptical ; anterior suckers large, stalked ; suck-
 ing disk without radial ridges and with two hooks :
 in mouth of marine fishes

Encotyllabe Dies. (Fig. 11)

- d_2 . Body elongate, cylindrical, and sometimes ringed ; sucking
 disk terminal, without radial ridges or hooks ; pharynx
 extensible ; genital pores median ; no eyes : on parasitic
 crustaceans Subfamily III. *Udonellinae*

- e_1 . Anterior suckers present ; body ringed in youth ;
 pharynx without hooks ; one testis : on *Caligus* and
Anchorella. . . . *Udonella* Johnst. (Fig. 12)

- e_2 . Anterior suckers absent, but in their place a pair of
 projections : on *Caligus*.

- f_1 . Body ringed ; anterior projections narrow, tentacle-
 like ; pharynx with two hooks

Echinella v. Ben. et Hesse (Fig. 13)

- f_2 . Body ringed in youth, swollen in middle ; anterior
 projections broad, membranous ; pharynx without
 hooks, but with a large number of minute rods

Pteronella v. Ben. et Hesse (Fig. 14)

- c_2 . Paired anterior suckers or projections absent ; sucking disk with
 or without radial ridges ; body flattened and usually broad

Family III. *Monocotylidæ*

- d_1 . Sucking disk very small, without radial ridges or hooks : on
 skin of selachians.

- e_1 . Body elliptical, with truncated ends ; vagina paired ;
 testes usually numerous

Pseudocotyle v. Ben. et Hesse (Fig. 15)

- e_2 . Body elliptical, with attenuated ends ; vagina unpaired,
 opening on left of ventral surface ; one large testis.

Microbothrium Ols. (Fig. 16)

- d_2 . Sucking disk large, with radial ridges and (except in *Lophocotyle*) two hooks ; paired adhesive glands at anterior
 end.

- e_1 . Anterior glandular areas large and prominent, one on each side of anterior end.
 - f_1 . Body elongate; sucking disk nearly circular and containing one central, eighteen peripheral, and seven intermediary depressions; one very large testis: on skin of skates
Merizocotyle Cerf. (Fig. 17)
 - f_2 . Body elongate; four eyes; sucking disk elliptical, with ten radial ridges; two testes; no vagina: on gills of Remora . Dionchus Goto (Fig. 18)
 - f_3 . Body ovoid; sucking disk circular, with numerous radial ridges, with no large, but a group of minute, hooks on its edge; testes numerous: on skin of marine fishes . . Lophocotyle Braun (Fig. 19)
- e_2 . Anterior glandular areas inconspicuous.
 - f_1 . Body heart-shaped; sucking disk with seven radial ridges; testes numerous: on skin and in the cloaca of marine fishes
Calicotyle Dies. (Fig. 20)
 - f_2 . Body elongate; sucking disk with eight radial ridges; three testes: on skin of marine fishes
Monocotyle Taschbg. (Fig. 21)
- b_2 . Body usually elongate and flattened, though sometimes broad, with a more or less distinct disk-like region at hinder end, bearing either suckers, or hooks, or both; paired anterior suckers either present or absent.
 - c_1 . Posterior disk-like region with suckers, usually paired, and, in most cases, with hooks; anterior paired suckers either present or absent.
 - d_1 . Posterior region with either two or six suckers; paired anterior suckers absent . . Subfamily I. Polystominae
 - e_1 . Posterior region with two (one pair) large suckers and two large hooks; body elongate: on skin of Nec-turus Sphyranura R. R. Wr. (Fig. 22)
 - e_2 . Posterior region with six (three pairs) suckers and with or without a terminal projection.
 - f_1 . Posterior region without a terminal projection; body rather broad; vagina paired, with an opening on either side of body: on gills and in urinary bladder of amphibians, and in mouth, nose, and urinary bladder of turtles
Polystoma Zeder (Fig. 23)
 - f_2 . Posterior region with a terminal projection.
 - g_1 . Posterior disk-like region bearing the suckers is oval, the terminal projection is rather wide

and bears two hooks ; body elongate : on gills of *Mustelus*

Erpocotyle v. Ben. et Hesse (Fig. 24)

g_2 . Suckers stalked ; terminal projection narrow, with four hooks ; body attenuated : on gills of *Accipenser*

Diplobothrium F. S. Leuck. (Fig. 25)

g_3 . The terminal projection is bifid at its extremity, each half bearing a small sucker ; body elongate : on gills of selachians

Onchocotyle Dies. (Fig. 26)

d_2 . Posterior region with four to eight large suckers ; paired anterior suckers present . Subfamily II. *Octocotylinæ*

e_1 . Posterior region with four (five) suckers.

f_1 . Posterior region with two pairs of suckers at the end of long stalks ; body elongate : on gills of marine fishes

Platycotyle v. Ben. et Hesse (Fig. 27)

f_2 . Posterior region with four suckers in a lateral, longitudinal row, to which may be added a fifth smaller sucker on the opposite side ; body elongate and asymmetrical : on gills of marine fishes (*Scomber*) . . . *Pleurocotyle* Gerv. (Fig. 28)

e_2 . Posterior region with six (three pairs) suckers.

f_1 . Body elongate ; posterior region with the six suckers bears at its posterior end a tail-like projection, at the extremity of which is a single sucker : on gills of marine fishes

Phyllocotyle v. Ben. et Hesse (Fig. 29)

f_2 . Body either elongate or broadly elliptical ; suckers on the broad posterior margin, in the median line of which, between the median suckers, a pair of hooks on a short projection may or may not be present : on gills of marine fishes

Plectanocotyle, Dies. (Fig. 30)

e_3 . Posterior region with eight (four pairs) suckers.

f_1 Individuals fused together, *x*-shaped, in pairs ; body elongate ; posterior suckers sessile : on gills of fresh-water fishes *Diplozoön* v. Nordm. (Fig. 31)

f_2 . Individuals not fused together in pairs.

g_1 . Body asymmetrical, elongate, composed of two equal portions, which form an angle with each other ; posterior suckers sessile : on gills of *Lichia*

Vallisia Par. et. Per. (Fig. 32)

g_2 . Body symmetrical.

h_1 . Posterior suckers alike in size.

i_1 . Posterior region with median hooks at or near its posterior end ; genital hooks with simple points.

j_1 . Body usually elongate ; posterior suckers with short stalks ; intestinal crura do not anastomose ; genital hooks arranged in groups ; vagina dorsal : on gills of marine fishes, especially the Clupidæ

Octobothrium F. S. Leuck. (Fig. 33)

j_2 . Body usually elongate, thick ; posterior suckers usually sessile ; genital hooks arranged in two lines in pairs ; no vagina : on gills of marine fishes, especially the Scomberidæ

Octocotyle Dies. (Fig. 34)

i_2 . Posterior region without median hooks ; genital hooks with double points and arranged in a circle.

j_1 . Body usually elongate ; suckers at the end of long stalks and functioning as pincers ; vagina ventral : on gills of marine fishes, especially the Gadidæ

Dactylocotyle v. Ben. et Hesse (Fig. 35)

j_2 . Body usually elongate ; suckers either stalked or not, and functioning as suckers, each sucker having a characteristic chitinous framework in form of a Greek cross ; no vagina : on gills of marine fishes, especially the Sparidæ

Diclidophora (Dies.) Goto (Fig. 36)

h_2 . Posterior suckers not alike in size, one pair differing from the others.

i_1 . Body elongate ; anterior pair of posterior suckers very large, at a distance from the others, projecting from the side of the body ; the other three pairs minute, stalked, and grouped

together at the extremity of the body :
on gills of marine fishes

Anthocotyle v. Ben. et Hesse (Fig. 37)

- i*₂. Body elongate ; anterior end pointed ;
posterior end bearing eight sessile
suckers at extremity of body, the
median pair being smaller than the
others : on gills of marine fishes

Hexocotyle Blain. (Fig. 38)

- d*₃. Posterior region elongate, and bearing numerous small
suckers, either paired or not ; paired anterior suckers
present Subfamily III. Microcotylinae

- e*₁. Body usually symmetrical ; posterior suckers paired,
numbering from 10 to 120 on a side ; no hooks : on
gills of marine fishes

Microcotyle v. Ben. et Hesse (Fig. 39)

- e*₂. Body asymmetrical, one lateral side being more devel-
oped than the other, and bearing most or all of the
suckers.

- f*₁. Body tapering anteriorly, widening towards the
hinder end, the latter forming, by a one-sided
lateral expansion, a broad asymmetrical terminal
disk bearing small suckers along its margin.

- g*₁. Numerous suckers along the longer side of the
terminal disk, a small number or none along
the other side ; no hooks present : on the
gills of marine fishes

Axine Abild. (Fig. 40)

- g*₂. A single row of suckers along the terminal disk,
which is prolonged into a spatula-shaped
appendix bearing two hooks : on gills of
marine fishes (Caranx)

Pseudaxine Par. et Per. (Fig. 41)

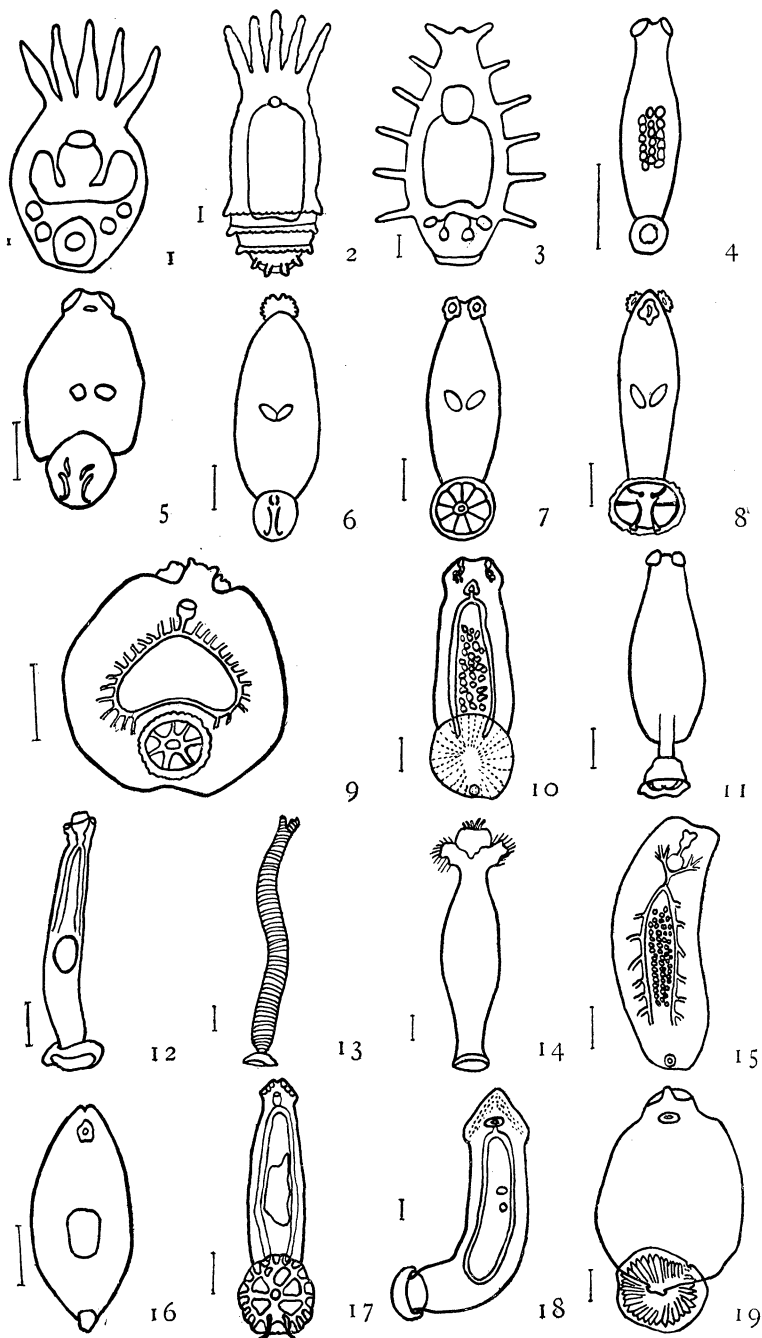
- f*₂. Anterior end of body attenuate, hinder two-thirds
widened on one side, on the margin of which is a
row of small suckers ; hooks present at the pos-
terior end : on the gills of marine fishes

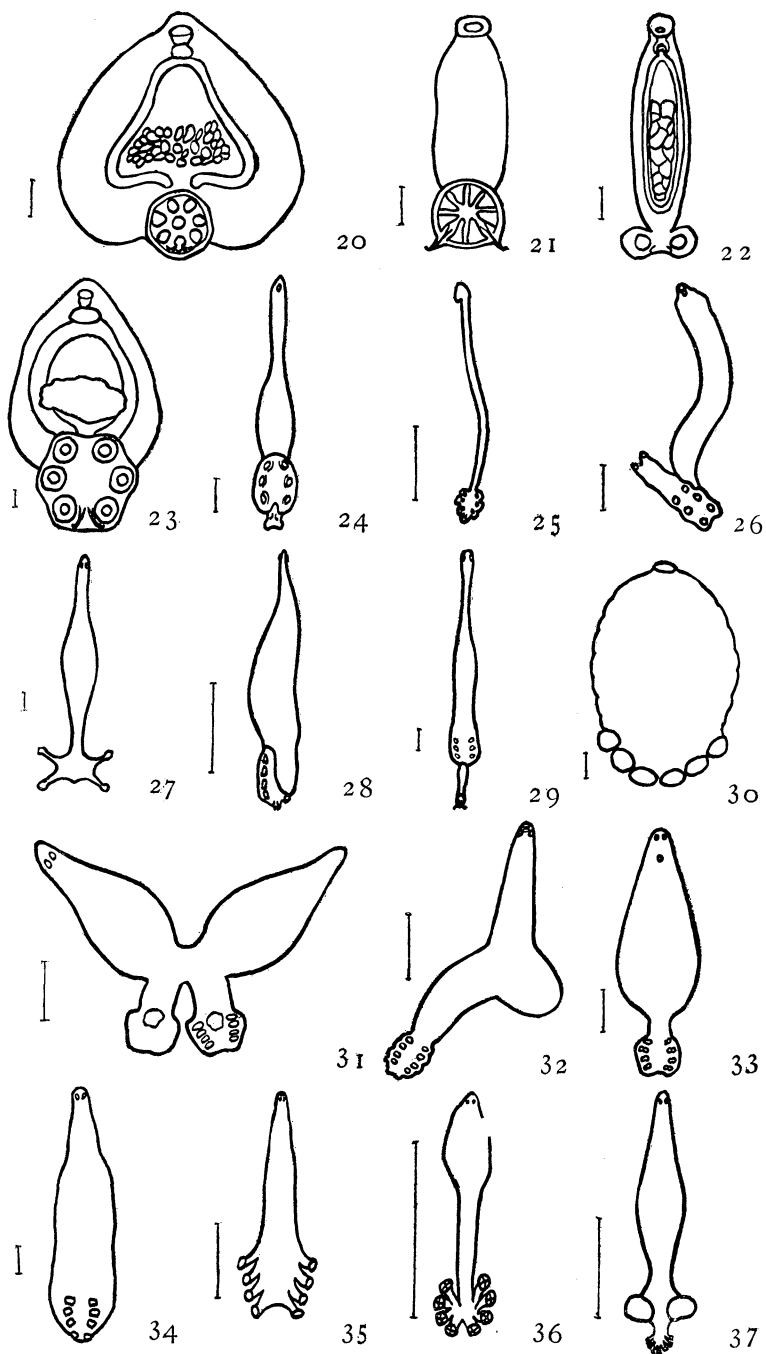
Gastrocotyle v. Ben. et Hesse (Fig. 42)

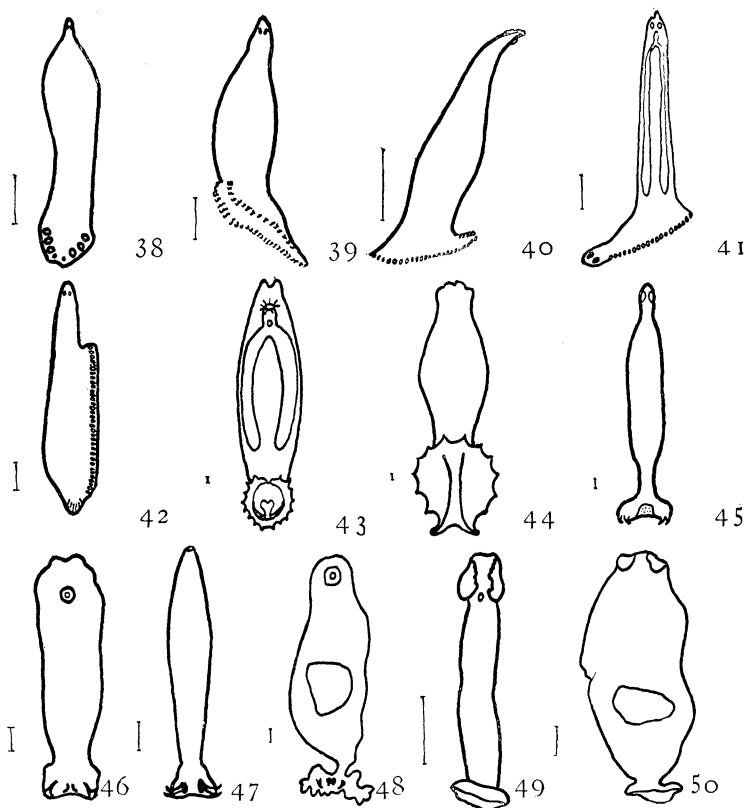
- c*₂. Posterior region usually disk-like, without suckers, but with
hooks Family V. Gyrodactylidae

- d*₁. Two or four short tentacle-like projections at anterior end
of body ; posterior disk with two large central hooks and
numerous small marginal ones ; worms minute : on skin
and gills of fresh-water and marine fishes.

- e_1 . Two short anterior projections ; posterior disk with usually sixteen marginal hooks ; no eyes
Gyrodactylus v. Nordm. (Fig. 43)
- e_2 . Four short anterior projections ; posterior disk with usually fourteen marginal hooks ; four eyes
Dactylogyrus Dies. (Fig. 44)
- d_2 . No tentacle-like anterior projections.
 - e_1 . A pair of anterior suckers present ; posterior end extended transversely, with four marginal hooks : on the gills of marine fishes
Diplectanum Dies. (Fig. 45)
 - e_2 . No anterior suckers present.
 - f_1 . Posterior region with four large central hooks.
 - g_1 . Body contracted posteriorly ; posterior disk with a number (12-16) of small marginal hooks ; anterior end triangular, with four slight projections : usually on gills of fresh-water fishes . Tetraonchus Dies. (Fig. 46)
 - g_2 . Body elongate ; posterior region trilobed, with twelve minute marginal hooks : on gills of Torpedo . Amphibdella Chatin (Fig. 47)
 - g_3 . Posterior disk stalked, with lobed margin and no marginal hooks : on gills of Coregonus
Dactylodiscus Ols. (Fig. 48)
 - f_2 . Posterior region with no large central hooks or with but one.
 - g_1 . Broad, paired, membrane-like projection at anterior end ; posterior disk terminal, either unarmed, with minute hooks, or with a single large central hook ; body elongate, cylindrical : on gills of marine fishes
Calceostoma v. Ben. (Fig. 49)
 - g_2 . A pair of glandular areas at anterior end ; posterior disk terminal, irregularly elliptical, with minute hooks in center ; a prominent glandular projection in middle of right side of body : on eggs of a fresh-water fish in Brazil . . Fridericianella Brds. (Fig. 50)
 - g_3 . Two sucker-like depressions at anterior end ; posterior disk without hooks : on gills of Pagrus Anoplodiscus Sonsino.







The line to the left of the figures indicates the actual size of the animal. The measurements given in the keys, and upon which these lines are based, are usually maximum measurements. The softness and changeable form of the trematode make accurate measurements difficult.

- (1) *Temnocephala mexicana*; (2) *Craspedella spenceri*; (3) *Actinodactylella blanchardi*; (4) *Nitzschia elongata*; (5) *Epibdella bumpusii*; (6) *Phyllonella soleæ*; (7) *Trochopus tubiporus*; (8) *Placunella pini*; (9) *Tristoma coccineum*; (10) *Acanthocotyle verrilli*; (11) *Encotyllabe nordmanni*; (12) *Udonella caligorum*; (13) *Echinella hirundinis*; (14) *Pteronella molvæ*; (15) *Pseudocotyle squatinæ*; (16) *Microbothrium apiculatum*; (17) *Merizocotyle diaphanum*; (18) *Dionchus agassizi*; (19) *Lophocotyle cyclophora*; (20) *Calicotyle kroyeri*; (21) *Monocotyle myliobatis*; (22) *Sphyrnura osleri*; (23) *Polystoma hassalli*; (24) *Erpocotyle lævis*; (25) *Diplobothrium armatum*; (26) *Onchocotyle canis*; (27) *Platyocotyle gurnardi*; (28) *Pleurocotyle scombri*; (29) *Phyllocotyle gurnardi*; (30) *Plectanocotyle elliptica*; (31) *Diplozoön paradoxum*; (32) *Vallisia striata*; (33) *Octobothrium sagittatum*; (34) *Octocotyle scombri*; (35) *Dactylocotyle denticulatum*; (36) *Diclidophora affinis*; (37) *Anthocotyle merluccii*; (38) *Hexacotyle thunninæ*; (39) *Microcotyle longicauda*; (40) *Axine heterocerca*; (41) *Pseudaxine trachuri*; (42) *Gastrocotyle trachuri*; (43) *Gyrodactylus grœnlandicus*; (44) *Dactylogyrus auriculatus*; (45) *Diplectanum sciænæ*; (46) *Tetraonchus momenteron*; (47) *Amphibdella torpedinis*; (48) *Dactylosdiscus borealis*; (49) *Calceostoma elegans*; (50) *Fridericianella ovicola*.

KEY TO THE SPECIES OF NORTH-AMERICAN HETEROCOTYLEA.

GENUS TEMNOCEPHALA.

Body ovoid ; tentacles five in number, long and slender ; pharynx very large, intestine short but broad, with a pair of lateral anterior projections ; .5-1 mm. long, .2 mm. wide : on carapace of *Cambarus Digueti* (Mexico)

T. mexicana Vayssi re (Fig. 1)

GENUS EPIBELLA.

Body flat, smooth, ovate, slightly constricted behind the anterior suckers ; anterior suckers crossed by twenty-two ribs ; posterior sucker attached by pedicel at posterior margin of body, elliptical, with four hooks ; 12.5 mm. long, 8.35 mm. wide : on skin of *Dasyatis centrura* (Woods Holl)

E. bumpusii Linton (Fig. 5)

GENUS TRISTOMA.

*a*₁. Diameter of sucking disk less than a third the length of the body.

*b*₁. Body ovate ; sucking disk small, less than a quarter the length of body and but little larger than the anterior suckers ; 10 mm. long, 7 mm. wide : on gills of *Tetrapturus albidus*

T. cornutum Verrill

*b*₂. Body heart-shaped ; color white, with small oval spots on the dorsal surface ; anterior end between the anterior suckers fringed ; 22.5 mm. long, 18 mm. wide : on the body of *Diodon* (California)

T. maculatum Rud.

*b*₃. Body nearly circular, ventral periphery with short, radial rows of papill e, and dorsal surface with several series of pointed black papill e ; sucking disk with crenulate border, and not reaching the posterior end of body ; 15 mm. long, 12 mm. wide : on gills of sword fish (Woods Holl, Linton) . . . *toccineum* Cuv. (Fig. 9)

*a*₂. Diameter of sucking disk equals one-third or half the length of body.

*b*₁. Body circular, ventral surface covered with papill e ; sucking disk large, its diameter equaling half the length of the body, and with a large central area ; 15 mm. long, 14 mm. wide : on gills of *Tetrapturus albidus* (Woods Holl, Linton) . . . *T. l eve* Verrill

*b*₂. Body almost circular, slightly attenuate forward ; sucking disk large, its diameter equaling one-third the length of body, and with a plicate membranous border ; 18 mm. long, 19 mm. wide : on *Mola mola* (Woods Holl, Linton) *T. mola* Blanch.

GENUS NITZSCHIA.

*a*₁. Body lanceolate, reddish, contracted posteriorly ; sucking disk globose ; anterior suckers large, linear, oblique ; mouth triangular ; 16 mm.

- long, 5 mm. wide ; from gills and under the opercles of sturgeon (Woods Holl, Linton, etc.) *N. elongata* Nitzsch (Fig. 4)
- a*₂. Body linear, contracted posteriorly, very small ; anterior portion papillose ; sucking disk not globose ; 1.9 mm. long, .5 mm. wide : from cod (Woods Holl) *N. papillosa* Linton

GENUS ACANTHOCOTYLE.

Body linear ; anterior end blunt with a pair of glands and without anterior suckers ; sucking disk large, circular, as wide as the body, with thirty-four radial rows of hooks ; about thirty-seven testes ; 5 mm. long, 1.2 mm. wide : on skin of skate (Cape Cod) . *A. verrilli* Goto (Fig. 10)

GENUS DIONCHUS.

Intestine bifurcate, distal ends fused ; anterior end of body triangular, with two groups of glands ; genital pore minute, on left side of ventral surface, near mouth ; 2 mm. long, .5 mm. wide (Newport)

D. agassizi Goto (Fig. 18)

GENUS POLYSTOMA.

*a*₁. Posterior disk-like region attached to body between the two anterior pairs of suckers.

*b*₁. Body elongate, lanceolate ; disk wider than body ; three pairs minute hooks between anterior pair of suckers, one large and two small pairs between posterior pair of suckers ; 6 mm. long : in the nose of the food terrapin . . . *P. coronatum* Leidy

*b*₂. Body broad, tapering forward ; disk hexagonal ; testis a large slightly lobed body in center of body ; three pairs small hooks between anterior pair of suckers, and three pairs of small and one pair large hooks between posterior pair of suckers ; intestine bifurcate, unbranched ; 1.5 mm. long, 1 mm. wide : from urinary bladder of *Kinosternon pennsylvanicum*

P. hassalli, Goto (Fig. 23)

*a*₂. Posterior disk-like region, attached at its anterior end to body ; body elliptical ; intestine bifurcate, unbranched ; penis provided with sixteen spines, alternately small and large ; 2.5 mm. long, 1 mm. wide : in urinary bladder of musk turtle (*Aromochelys odoratus*)

P. oblongum R. R. Wr.

GENUS SPYRANURA.

Body elongate, contracted anteriorly and posteriorly just before disk, which is wider than body and bears two large suckers ; intestine bifurcate, unbranched ; testes numerous ; 4 mm. long, .6 mm. wide : on skin of Necturus *S. osleri* R. R. Wr. (Fig. 22)

GENUS OCTOBOTHRUM.

Body sagittate, tapering anteriorly ; posterior suckers on a distinct disk which is not so wide as the body ; 6 mm. long, 2 mm. wide : on gills of *Castastomus teres* (R. R. Wright) *O. sagittatum* F. S. Leuck.¹ (Fig. 33)

GENUS OCTOCOTYLE.

Body elongate, lanceolate ; anterior suckers elongate, posterior suckers small, slightly stalked, in two rows ; genital pore with two longitudinal rows of six (five) small hooks each ; two pairs of hooks between posterior pair of suckers ; 5 mm. long, .6 mm. broad : on gills of mackerel (Newport, Goto) *O. scombri* Kuhn (Fig. 34)

GENUS DACTYLOCOTYLE.

Body lanceolate ; anterior portion of each posterior sucker with numerous denticulate papillæ ; 8 mm. long, 2 mm. wide : on gills of the pollack (Woods Holl, Linton) *D. denticulatum* Ols. (Fig. 35)

GENUS DICLIDOPHORA.

Body elongate, spatulate, anterior portion elliptical, posterior portion cylindrical ; posterior suckers on long stalks ; cirrus armed with fifteen bifurcate hooks ; 12-40 mm. long : from the mouth of flounder (Woods Holl) *D. offinis* Linton (Fig. 36)

GENUS MICROCOTYLE.

*a*₁. Testes not numerous, twelve to fifteen in number, median in hinder part of body.

*b*₁. Testes about twelve in number, in front of which is ovary ; length of sucker-bearing region about one-third that of body, with about forty-six pairs of suckers ; 2.5 mm. long, .6 mm. wide : on gills of Scup (Newport) *M. stenotomi* Goto

*b*₂. Testes about fifteen in number, in front of which is ovary ; length of sucker-bearing region about one-fourth that of body, with about twenty-three pairs of suckers ; 2.5 mm. long, .6 mm. wide : on gills of blackfish (Newport) *M. hiatulæ* Goto

*a*₂. Testes numerous, fifty to fifty-five in number, median in hinder part of body.

*b*₁. Testes about fifty in number, in front of which is ovary ; length of sucker-bearing region about one-third that of body, with about seventy pairs of suckers ; 4 mm. long, 1 mm. wide : on gills of bluefish (Newport) *M. pomatomi* Goto

¹ The systematic position of this species is uncertain.

- b*₂. Testes about fifty-five in number, in front of which is ovary ; length of sucker-bearing region about seven-elevenths that of body, with about 120 pairs of suckers ; 7 mm. long, 2 mm. wide : on gills of weakfish (Newport) . *M. longicauda* Goto (Fig. 39)

GENUS GYRODACTYLUS.

Body elongate, elliptical, mouth surrounded by a row of spines ; posterior disk round ; the large central hooks have each double tubercles on its base ; 1 mm. long, .2 mm. wide : on *Cottus scorpius*

G. grænlandicus Lev. (Fig. 43)

GENUS PLECTANOCOTYLE.

Body elliptical, broad ; mouth terminal ; no median posterior projection or hooks ; 4 mm. long, 2 mm. wide : on gills of *Roccus americanus*

P. elliptica Dies. (Fig. 30)

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